Improved Physically-based AMSR-E Oceanic Rainfall Algorithm

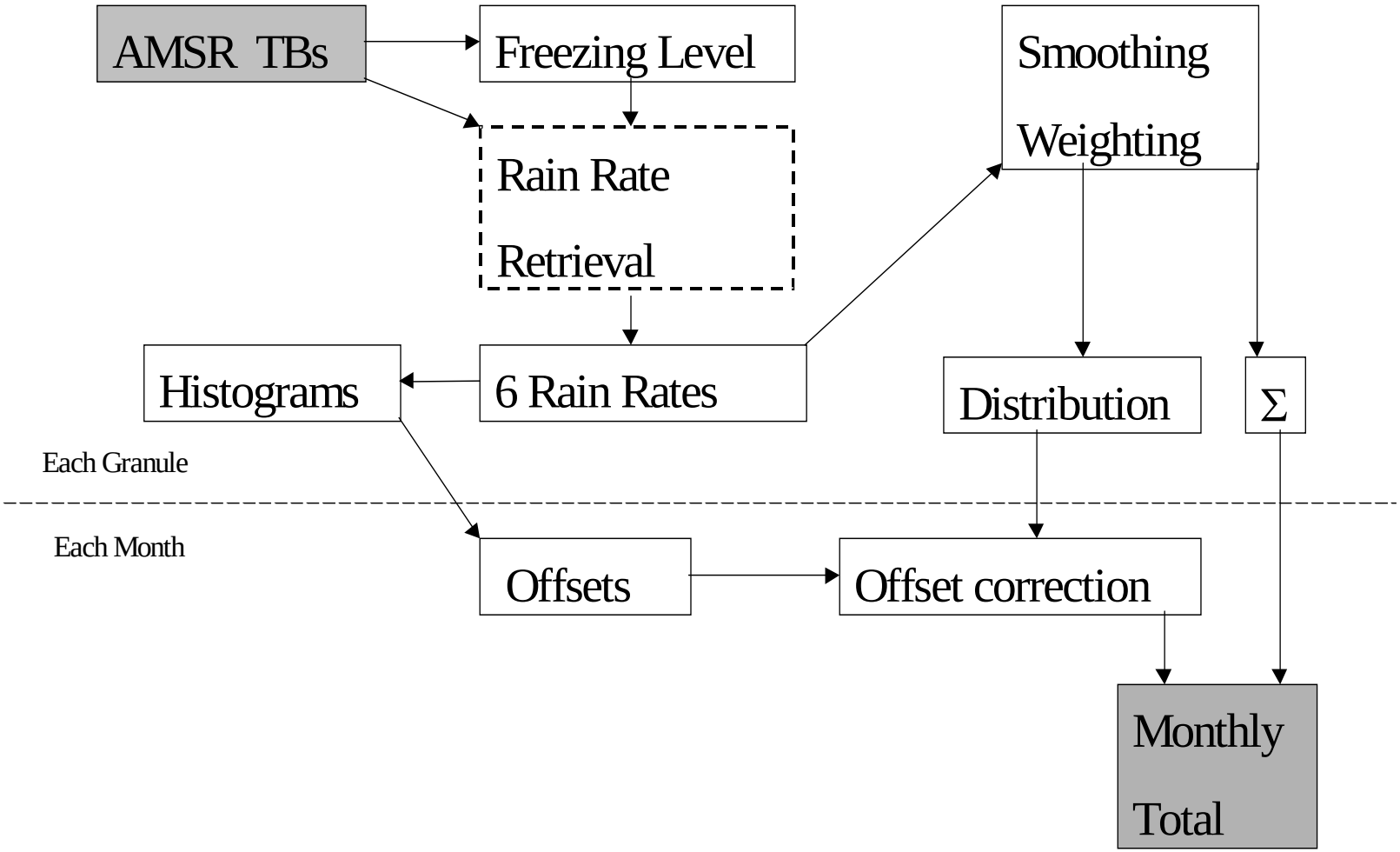
K-W Jin, S-W Hong, R. Weitz, T. Wilheit*

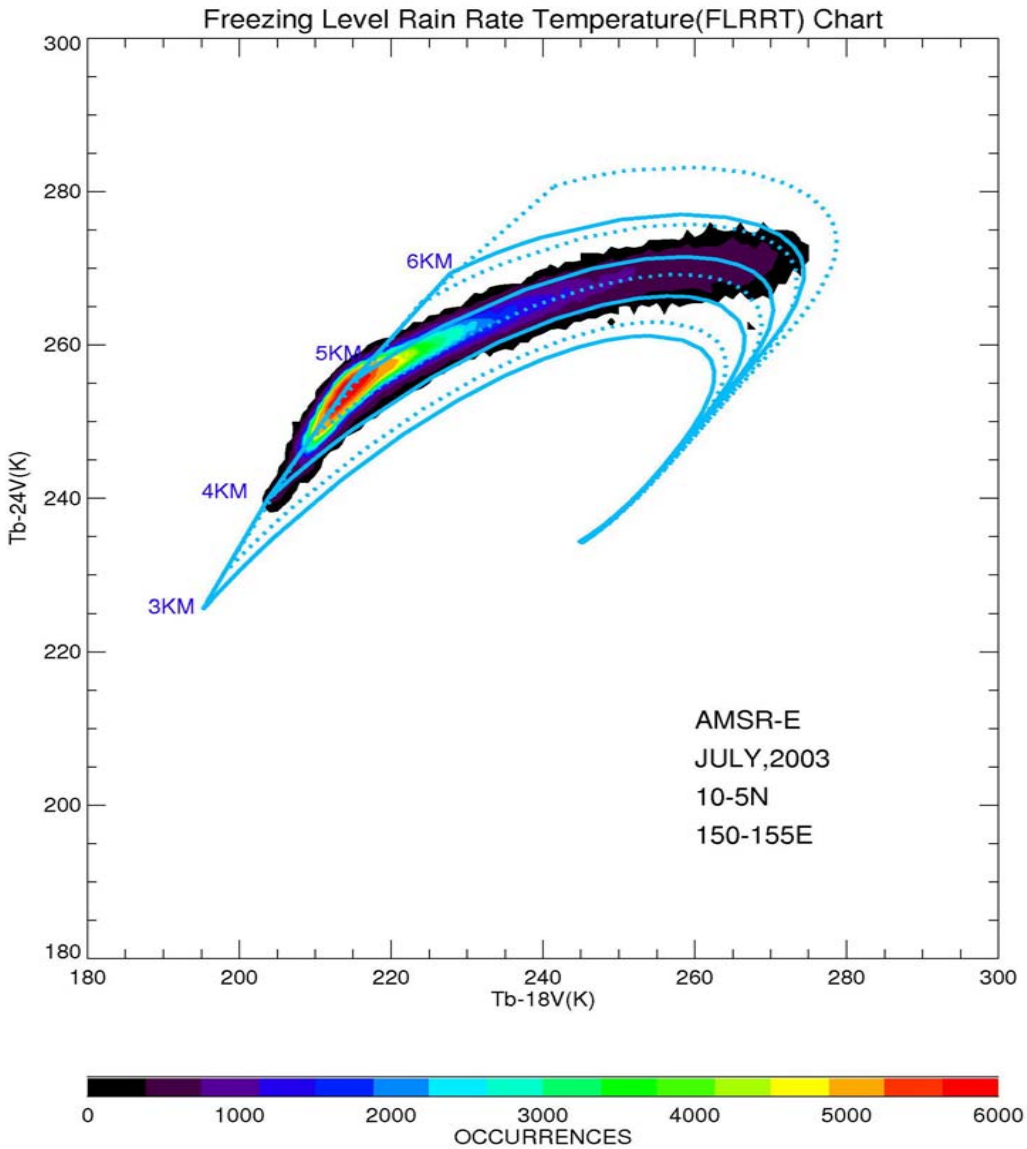
Department of Atmospheric Science

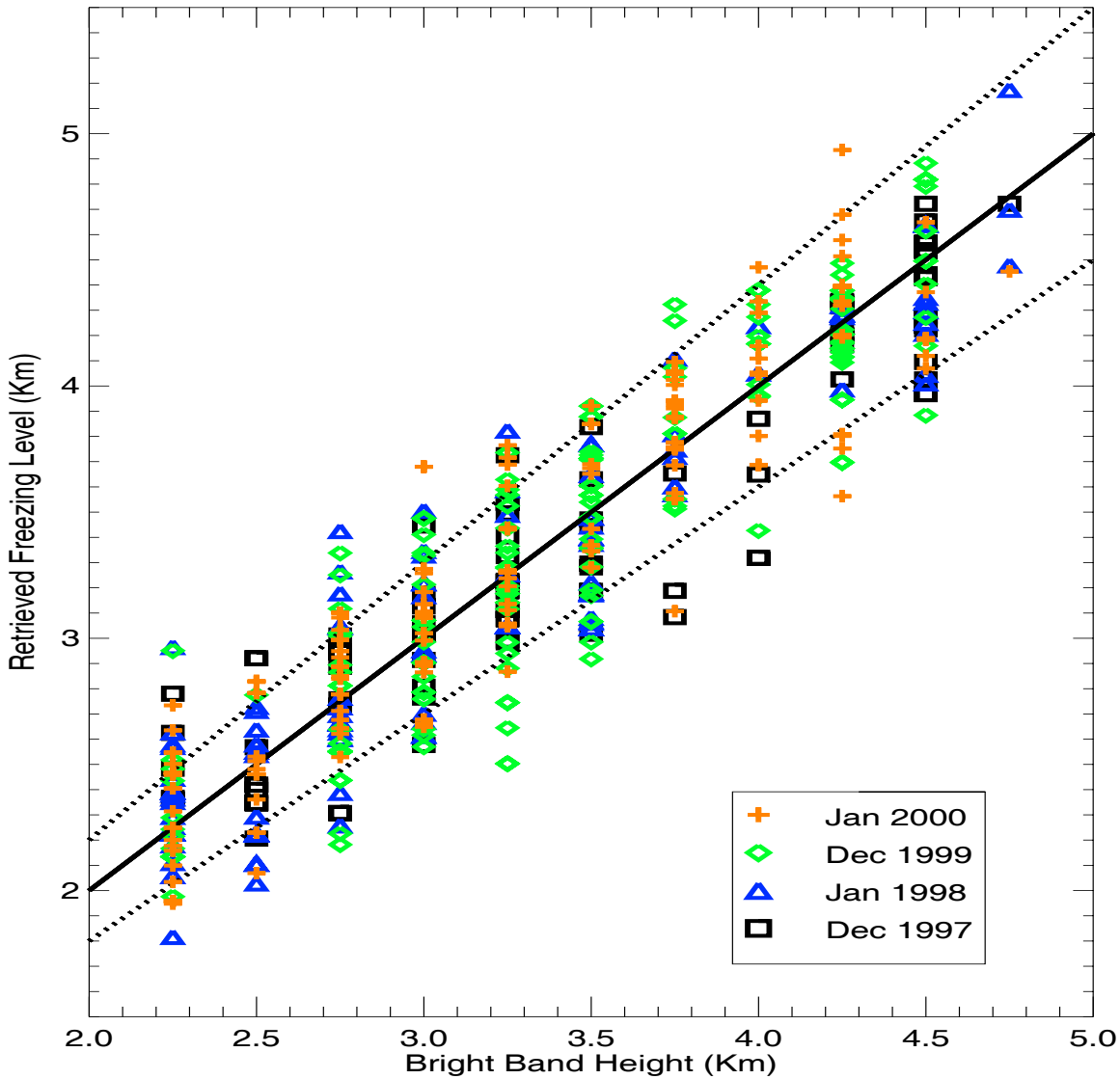
Texas A&M University

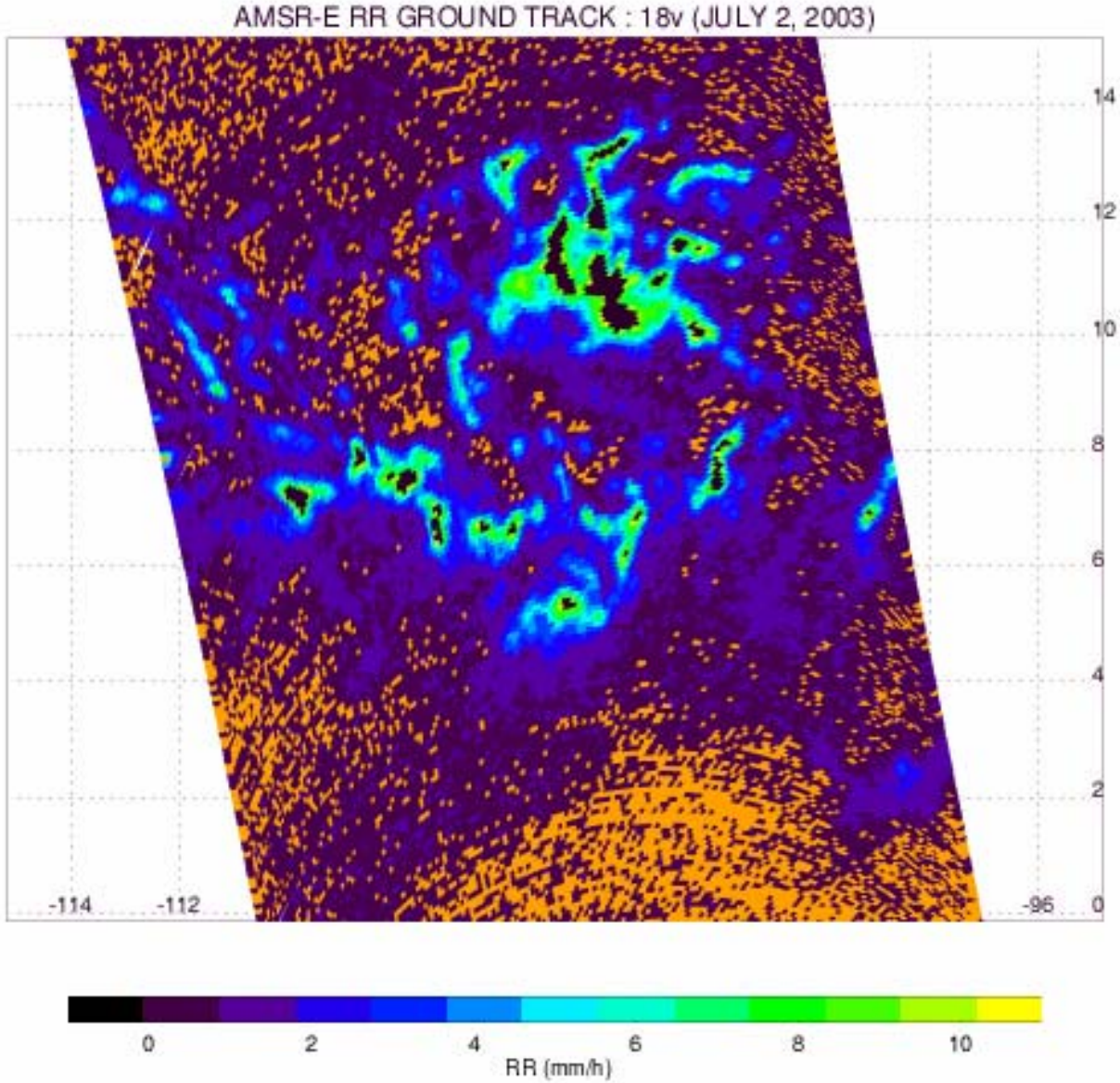
College Station, TX USA

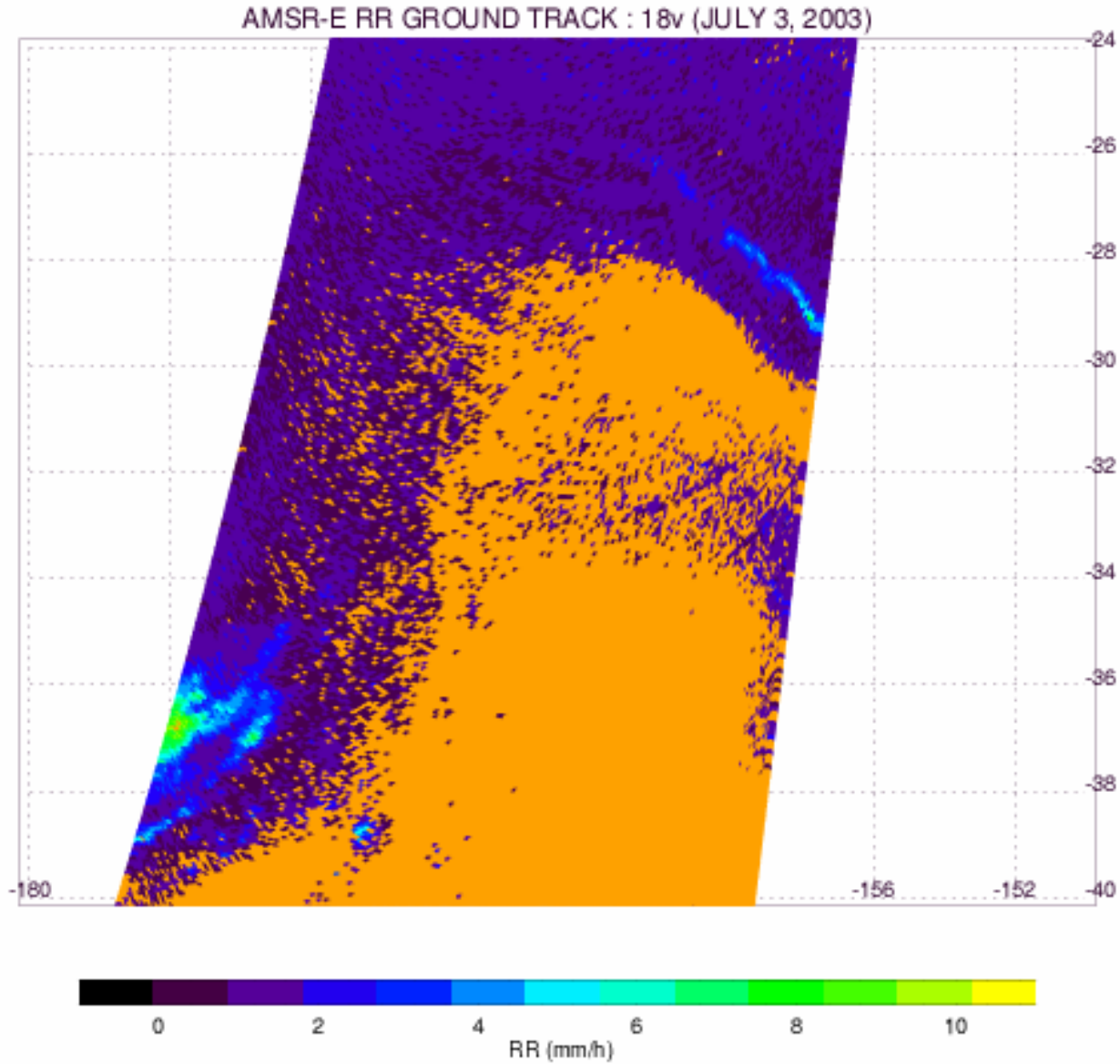
* Presenting Author

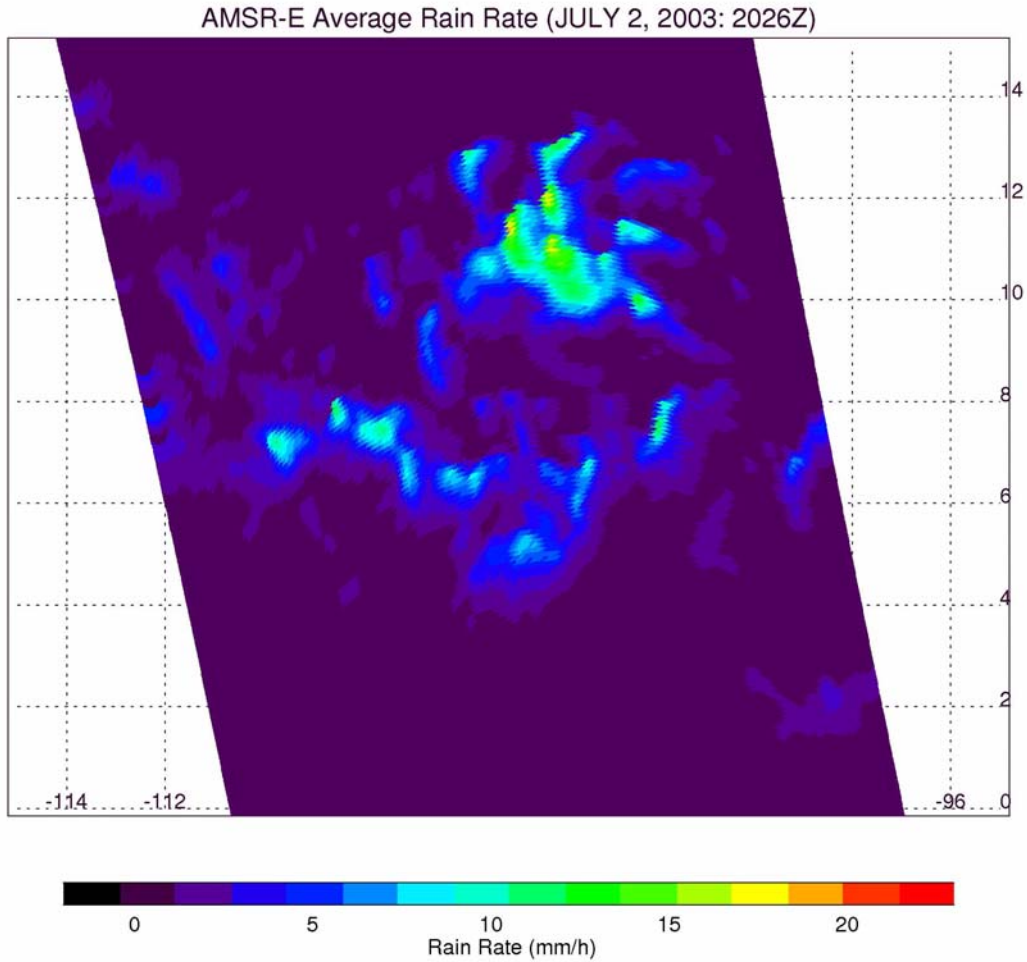

AMSR TBs
Freezing Level
Smoothing
Weighting
Rain Rate
Retrieval
Histograms
6 Rain Rates
Distribution
Σ
Each Granule
Each Month
Offsets
Offset correction
Monthly
Total

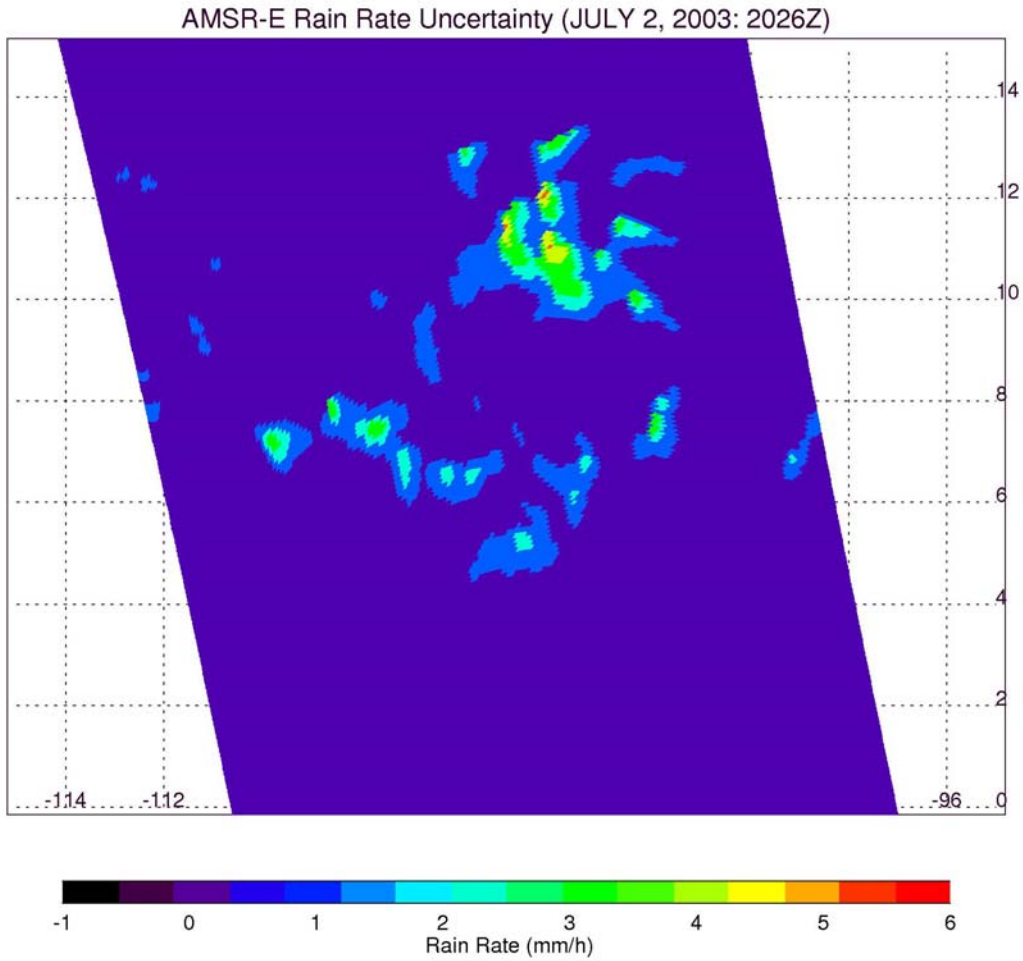

Freezing Level Rain Rate Temperature(FLRRT) Chart
300
280
260
240
220
200
180
Tb-24V(K)
6KM
5KM
4KM
3KM
AMSR-E
JULY,2003
10-5N
150-155E
180
200
220
240
260
280
300
Tb-18V(K)
0
1000
2000
3000
4000
5000
6000
OCCURRENCES

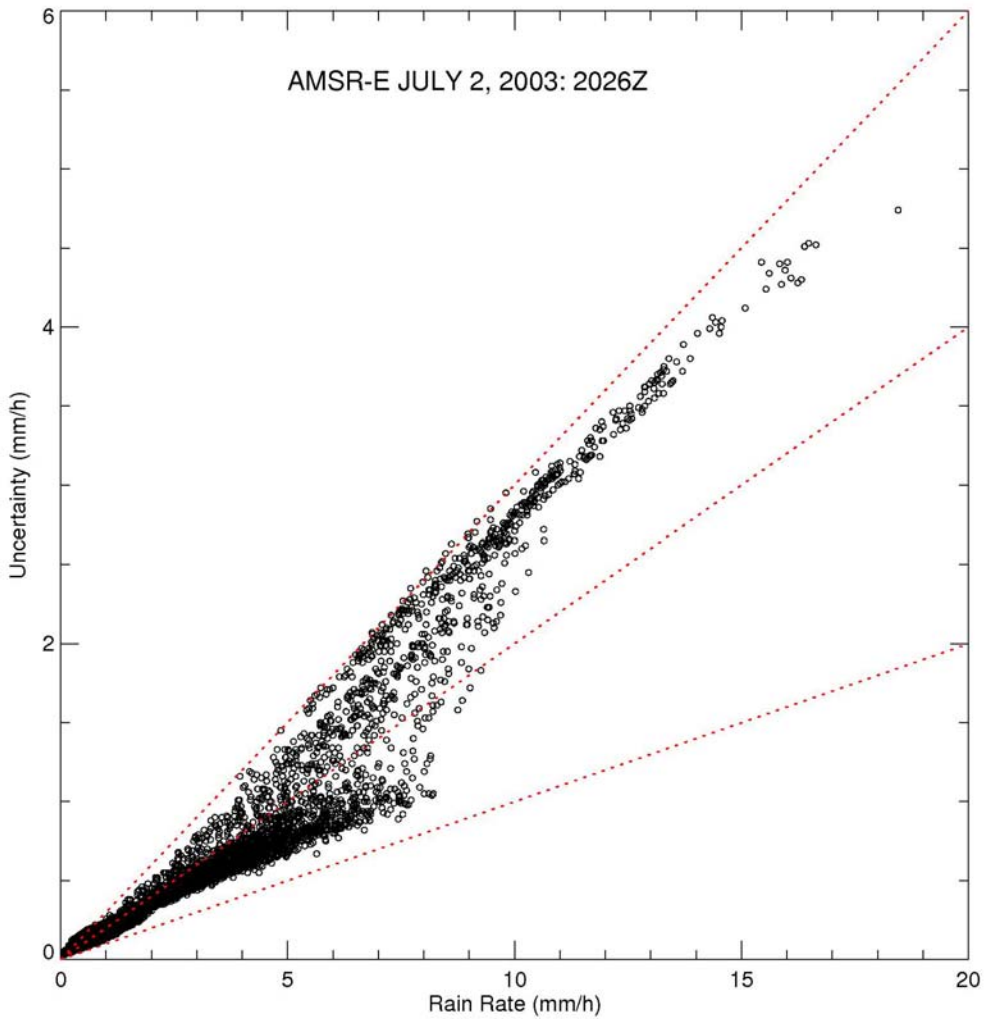

Retrieved Freezing Level (Km)
Bright Band Height (Km)
2
3
4
5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Jan 2000
Dec 1999
Jan 1998
Dec 1997

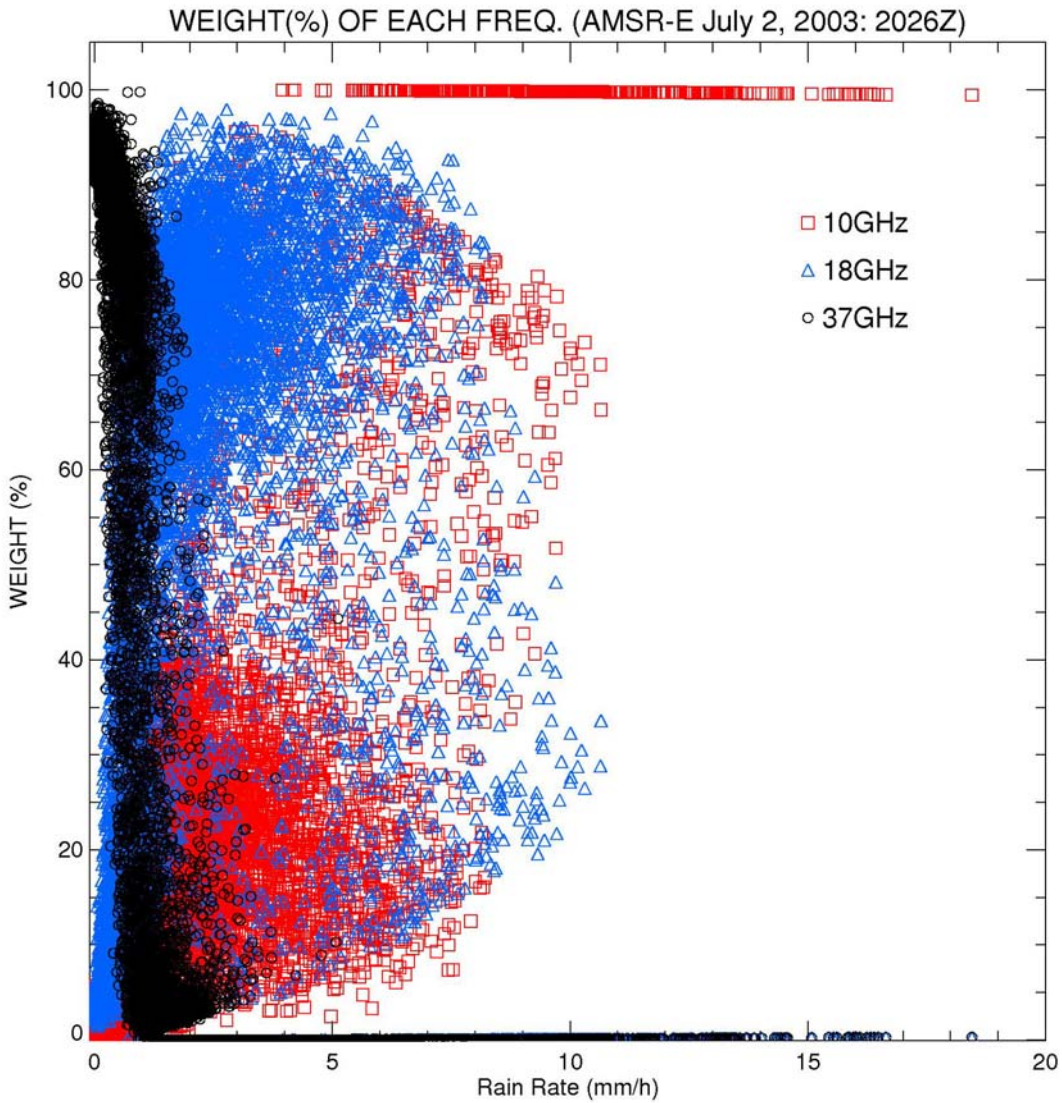

AMSR-E RR GROUND TRACK : 18v (JULY 2, 2003)
14
12
10
8
6
4
2
0
-114
-112
-96
0
2
4
6
8
10
RR (mm/h)

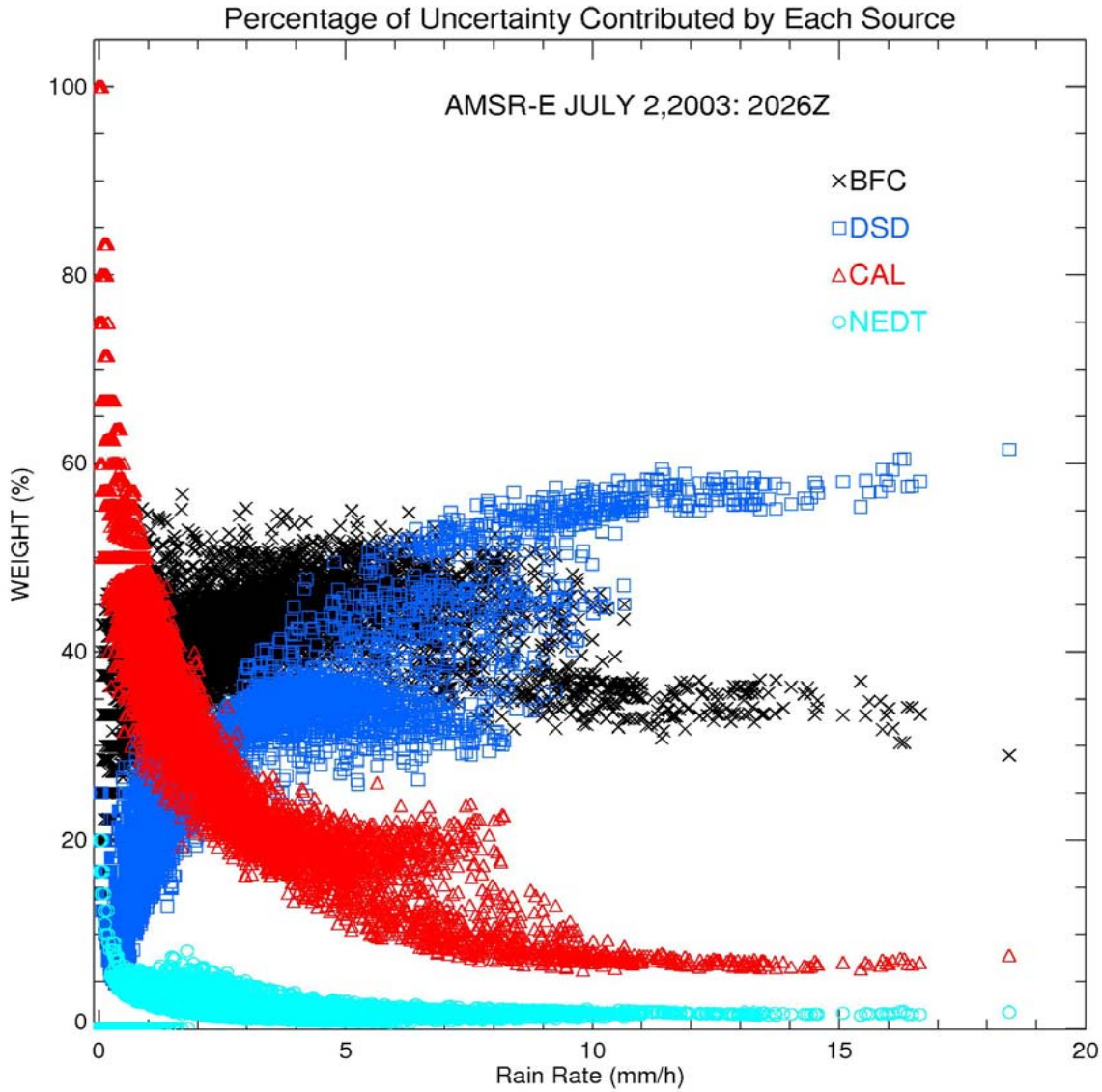

AMSR-E RR GROUND TRACK : 18v (JULY 3, 2003)
-24
-26
-28
-30
-32
-34
-36
-38
-40
-180
-156
-152
0
2
4
6
8
10
RR (mm/h)

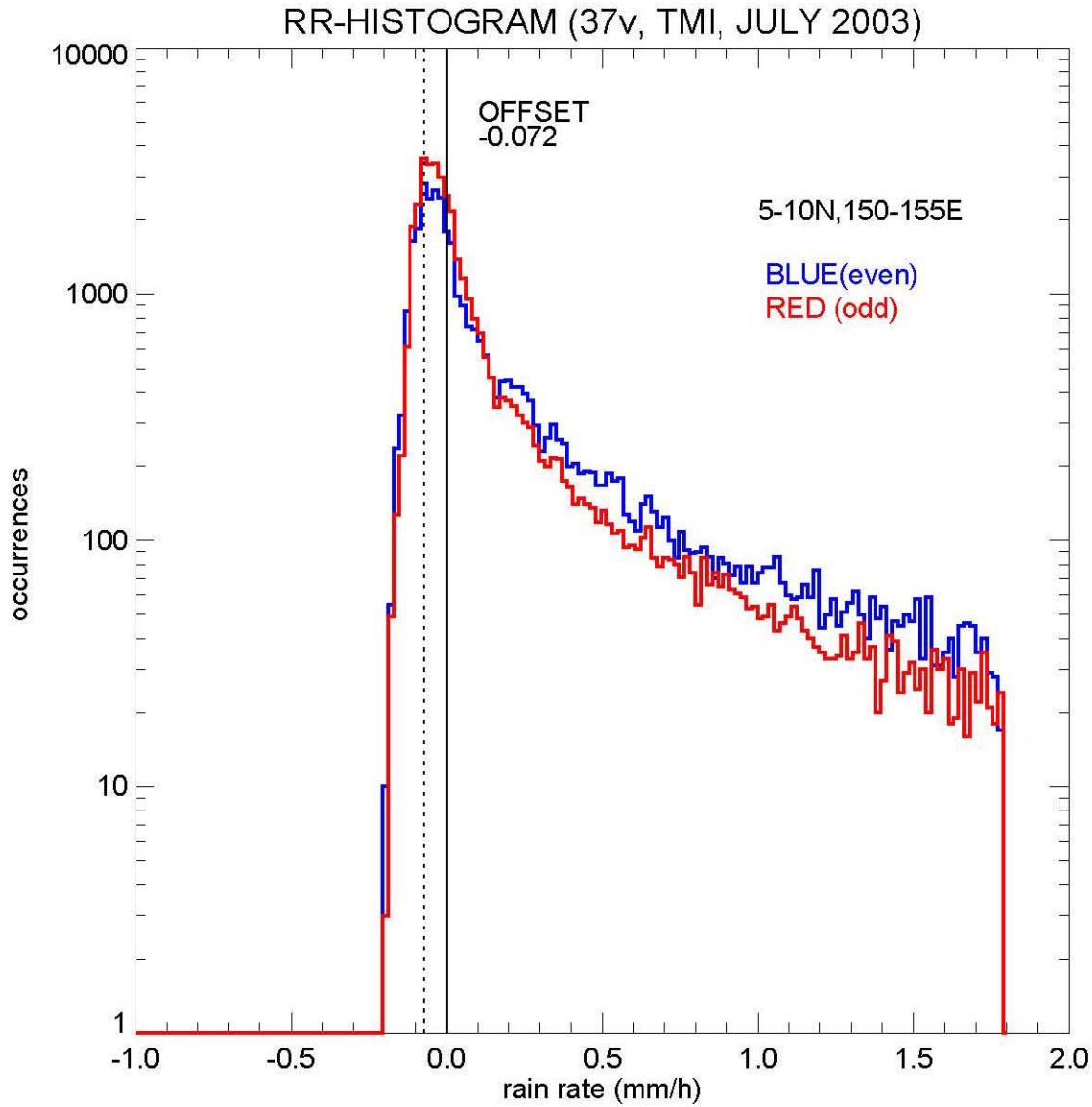

AMSR-E Average Rain Rate (JULY 2, 2003: 2026Z)
14
12
10
8
6
4
2
0
-114
-112
-96
0
5
10
15
20
Rain Rate (mm/h)

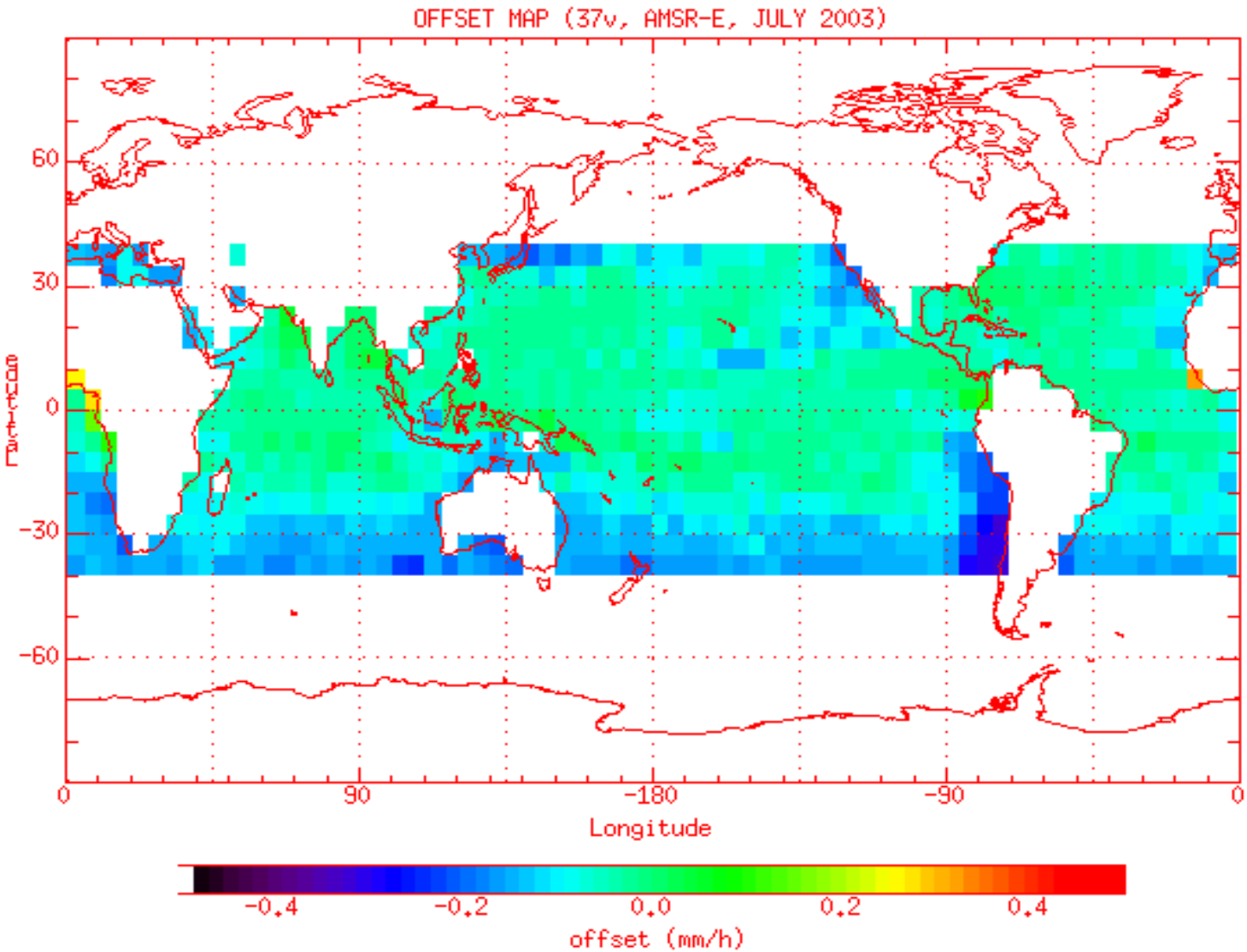

AMSR-E Rain Rate Uncertainty (JULY 2, 2003: 2026Z)
14
12
10
8
6
4
2
0
-114
-112
-96
-1
0
1
2
3
4
5
6
Rain Rate (mm/h)

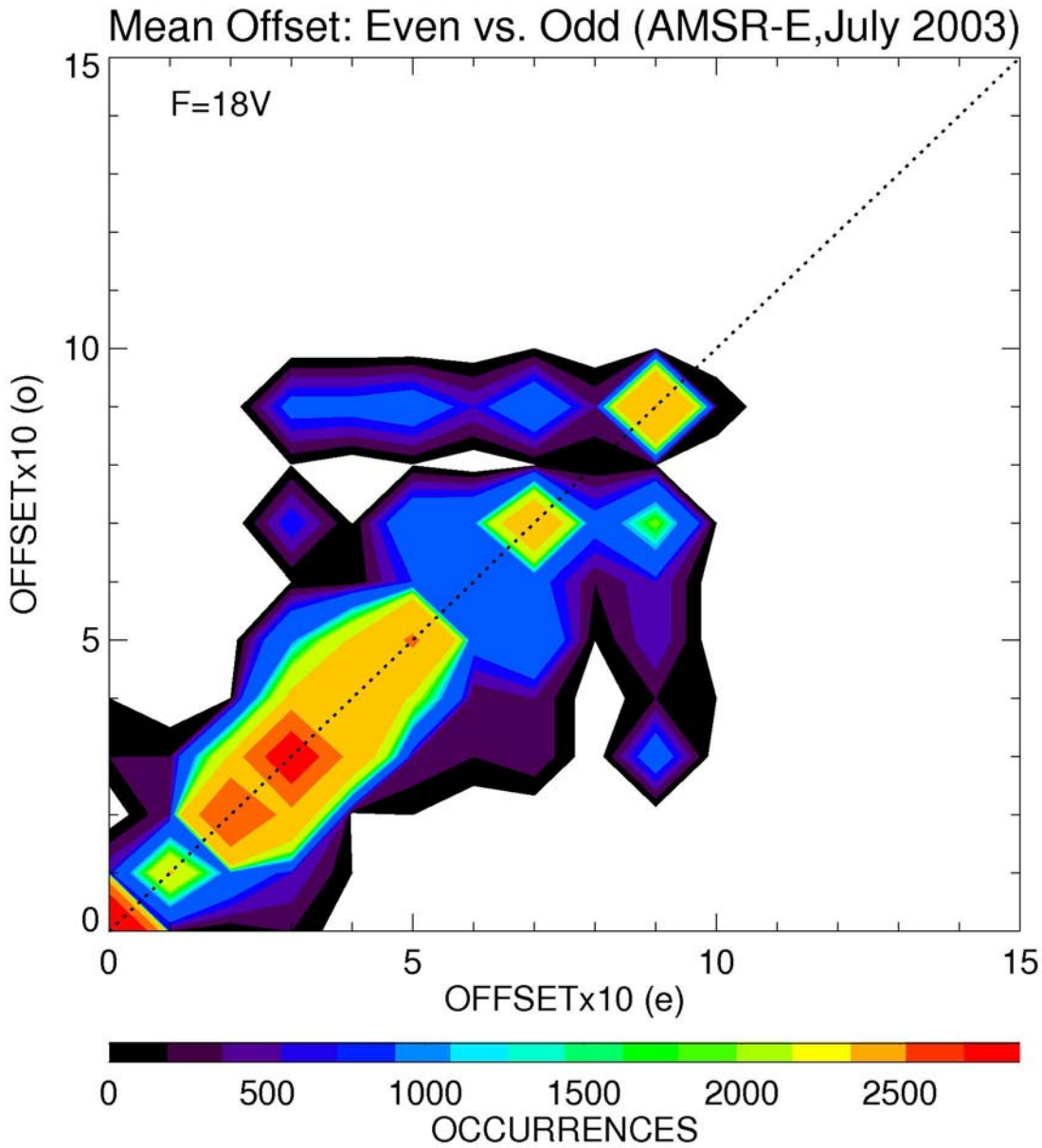

AMSR-E JULY 2, 2003: 2026Z
Uncertainty (mm/h)
Rain Rate (mm/h)
0
2
4
6
0
5
10
15
20

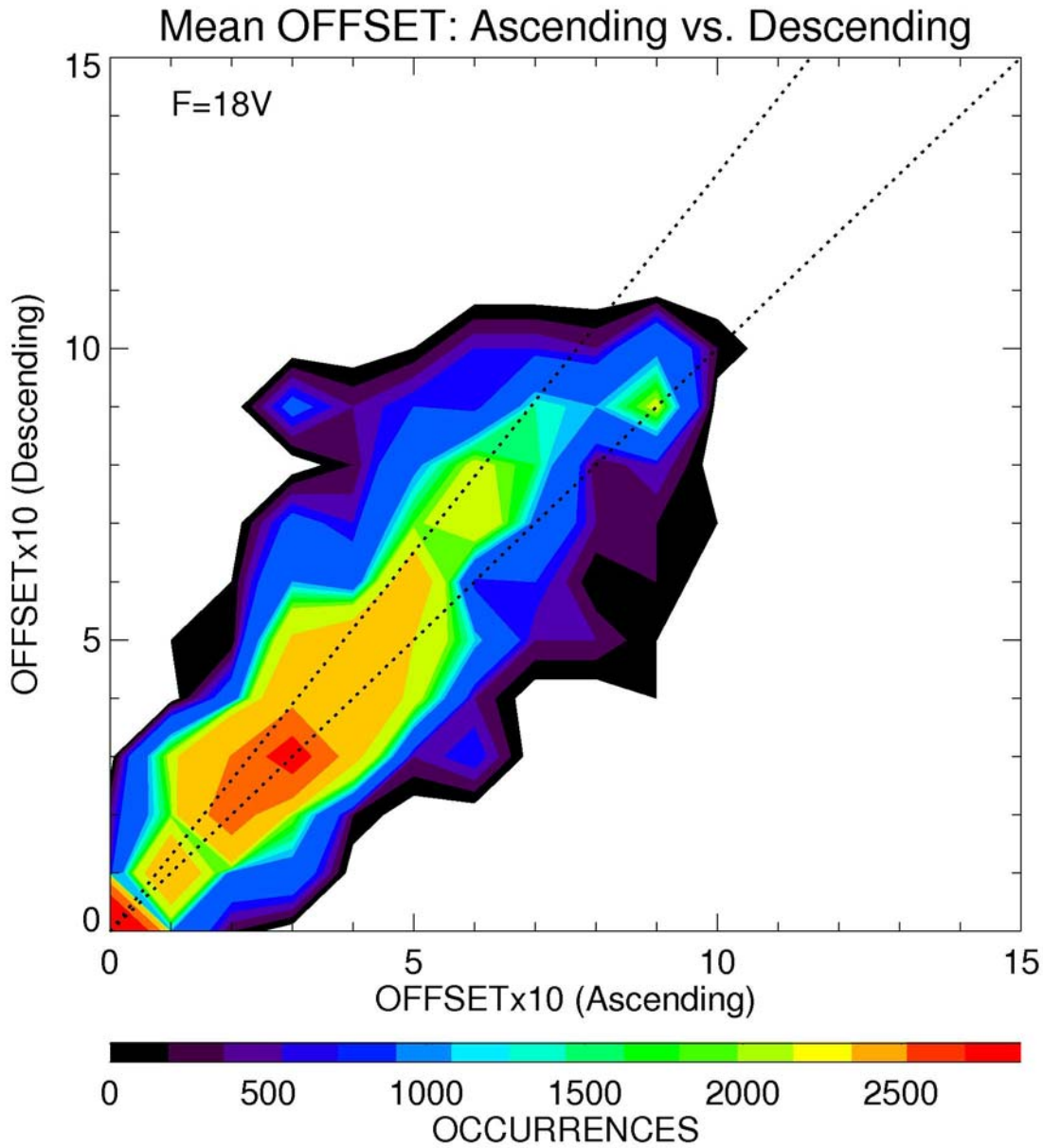

WEIGHT(%) OF EACH FREQ. (AMSR-E July 2, 2003: 2026Z)
WEIGHT (%)
Rain Rate (mm/h)
10GHz
18GHz
37GHz
0
20
40
60
80
100
0
5
10
15
20

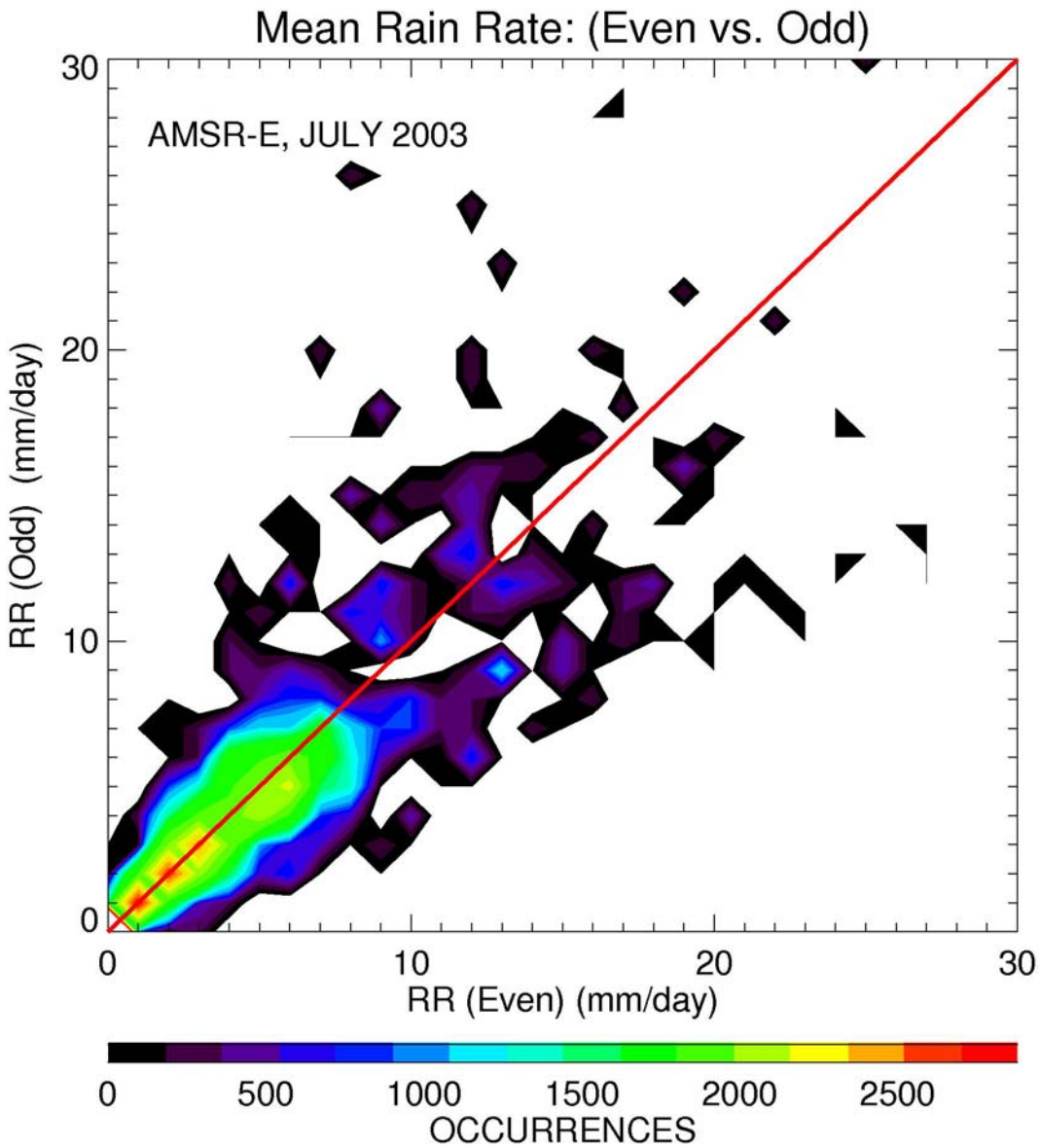

Percentage of Uncertainty Contributed by Each Source
AMSR-E JULY 2,2003: 2026Z
BFC
DSD
CAL
NEDT
WEIGHT (%)
Rain Rate (mm/h)
0
20
40
60
80
100
0
5
10
15
20

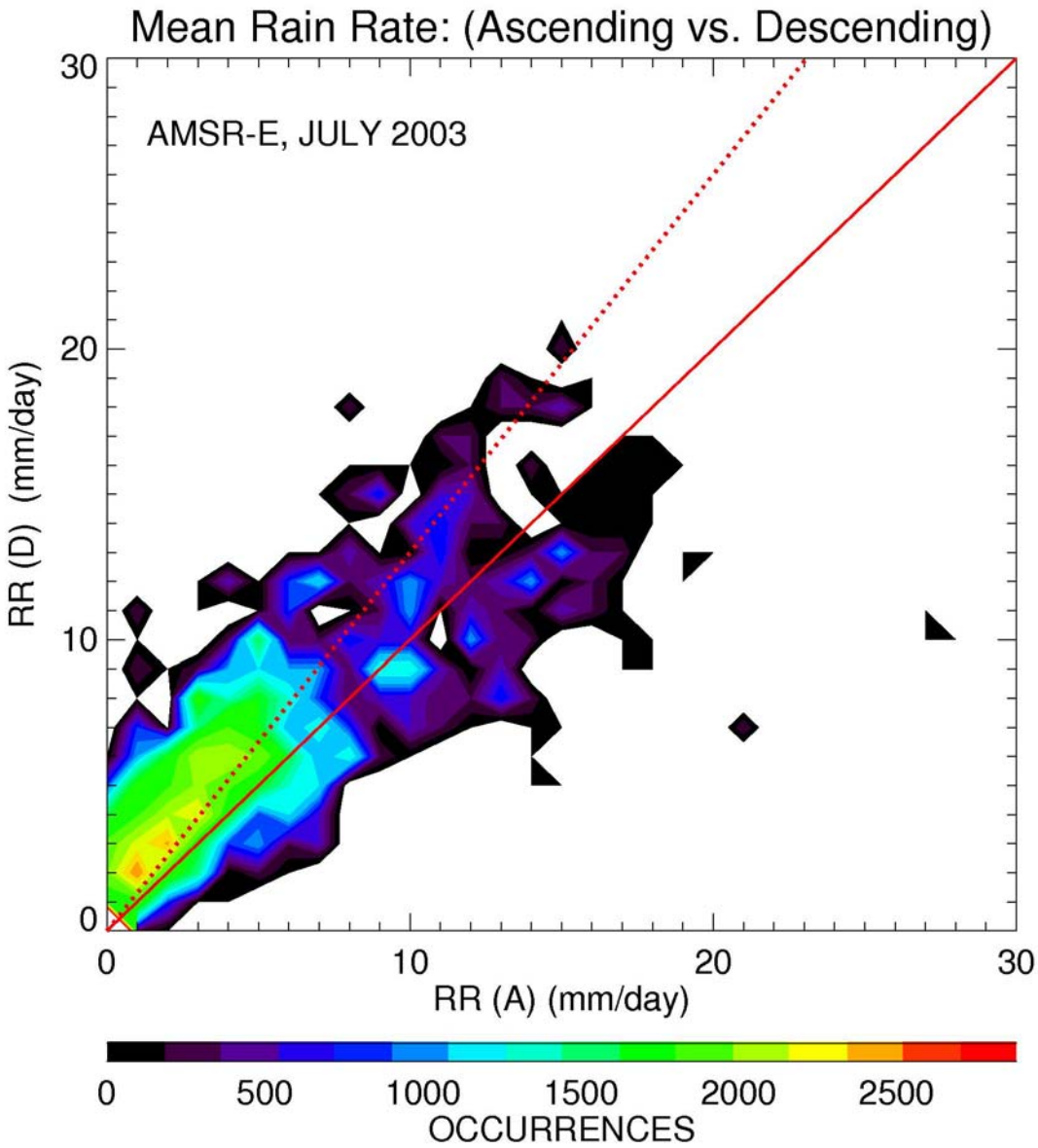

RR-HISTOGRAM (37v, TMI, JULY 2003)
OFFSET
-0.072
5-10N,150-155E
BLUE(even)
RED (odd)
occurrences
10000
1000
100
10
1
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
rain rate (mm/h)


OFFSET MAP (37v, AMSR-E, JULY 2003)
60
30
0
-30
-60
Latitude
0
90
-180
-90
0
Longitude
-0.4
-0.2
0.0
0.2
0.4
offset (mm/h)


Mean Offset: Even vs. Odd (AMSR-E,July 2003)
F=18V
OFFSETx10 (o)
OFFSETx10 (e)
0
5
10
15
0
500
1000
1500
2000
2500
OCCURRENCES


Mean OFFSET: Ascending vs. Descending
F=18V
OFFSETx10 (Descending)
OFFSETx10 (Ascending)
0
5
10
15
0
500
1000
1500
2000
2500
OCCURRENCES


Mean Rain Rate: (Even vs. Odd)
AMSR-E, JULY 2003
RR (Odd) (mm/day)
RR (Even) (mm/day)
0
10
20
30
0
500
1000
1500
2000
2500
OCCURRENCES


Mean Rain Rate: (Ascending vs. Descending)
AMSR-E, JULY 2003
RR (D) (mm/day)
RR (A) (mm/day)
0
10
20
30
0
500
1000
1500
2000
2500
OCCURRENCES

Conclusions

We have reduced freezing level bias

At Level-2 (10 GHz pixel), rainfall retrieval uncertainties vary from *ca.* 10% to 30%

Freezing level retrieval provides a useful “rain impossible” flag

Needs to be fine tuned to balance bias vs. random error

Variability of offset between ascending and descending suggests a calibration error